Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

from which the entries in the above examples are taken. It is to be hoped that such tables will be included in text-books, and made available at the examinations of the College Entrance Board.

PROBLEMS FOR SOLUTION.

SEND ALL COMMUNICATIONS ABOUT PROBLEMS AND SOLUTIONS TO B. F. FINKEL, Springfield, Mo.

2742. Proposed by S. A. COREY, Des Moines, Iowa.

Establish the following algebraic identity without actually performing the indicated operations:

$$
\begin{aligned}
2(t_1t_2 + c_1t_3t_4 + c_2t_5t_6 + c_1c_2t_7t_8)&(r_1r_2 + c_1r_3r_4 + c_2r_5r_6 + c_1c_2r_7r_8)\\
&= (r_1t_1 - c_1r_3t_3 - c_2r_5t_5 + c_1c_2r_7t_7)(r_2t_2 - c_1r_4t_4 - c_2r_6t_6 + c_1c_2r_8t_8)\\
&+ (r_1t_2 - c_1r_3t_4 - c_2r_5t_6 + c_1c_2r_7t_8)(r_2t_1 - c_1r_4t_3 - c_2r_6t_5 + c_1c_2r_8t_7)\\
&+ c_1(r_1t_3 + r_3t_1 - c_2r_5t_7 - c_2r_7t_5)(r_2t_4 + r_4t_2 - c_2r_6t_8 - c_2r_8t_6)\\
&+ c_1(r_1t_4 + r_3t_2 - c_2r_5t_8 - c_2r_7t_6)(r_2t_3 + r_4t_1 - c_2r_6t_7 - c_2r_8t_5)\\
&+ c_2(r_1t_5 + c_1r_3t_7 + r_5t_1 + c_1r_7t_3)(r_2t_6 + c_1r_4t_8 + r_6t_2 + c_1r_8t_4)\\
&+ c_2(r_1t_6 + c_1r_3t_8 + r_5t_2 + c_1r_7t_4)(r_2t_5 + c_1r_4t_7 + r_6t_1 + c_1r_8t_3)\\
&+ c_1c_2(r_1t_7 - r_3t_5 + r_5t_3 - r_7t_1)(r_2t_8 - r_4t_6 + r_6t_4 - r_8t_2)\\
&+ c_1c_2(r_1t_8 - r_3t_6 + r_5t_4 - r_7t_2)(r_2t_7 - r_4t_5 + r_6t_3 - r_8t_1).
\end{aligned}
$$

By assuming special relations between the constants involved show that the product of the sum of four squares by the sum of four squares equals the sum of four squares.

2743. Proposed by DANIEL KRETH, Wellman, Iowa.

In the right angle triangle ABC, right angle C, we have given on the hypotenuse the segments $AD = 15$, $DE = 10$, and $EB = 15$; and the angle DCE equal to the angle ECB. Find the angle DCE, and the sides AC and BC.

2744. Proposed by J. B. REYNOLDS, Lehigh University.

The vertices of a triangle are $(0, 0)$, $(2a, 0)$, and $(2x, 2y)$. Where are the vertices of the triangle of least area having its vertices on the perpendicular bisectors of the sides of the given triangle and the same center of gravity as the given triangle.

2745. Proposed by C. N. SCHMALL, New York City.

In the parabola, $y^2 = 4ax$, two normals to the curve are drawn at the ends of a focal chord. Show that the area between these normals and the curve is $20a^2/3 \sin^3 2\phi$, where ϕ is the angle between one of the normals and the x-axis.

2746. Proposed by A. CAMPBELL, St. Johnsbury, Vt.

Given the base, the sum of the sides of the triangle, and the difference of the base angles, to construct the triangle.

2747. Proposed by ENOS W. WITMER, Sophomore in Franklin and Marshall College.

Investigate the problem of solving the equation, $x^4 + ay^4 = w^2 + av^2$. Carmichael's *Diophantine Analysis*, problem 18, page 54.

2748. Proposed by ROGER E. MOORE, University of Wisconsin.

Test for convergence, the series $\sum_{n=1}^{\infty} a_n$, in which

$$a_n = \left[\frac{1\cdot 3\cdot 5 \cdots (2n-1)}{2\cdot 4\cdot 6 \cdots 2n}\right]^2.$$

2749. Proposed by A. M. HARDING, University of Arkansas.

Through a point, P, within a circle, draw a chord which will be trisected at P.

2750. Proposed by J. W. LASLEY, JR., University of North Carolina.

Given $\bar{x} = \tan^{-1}\dfrac{z}{\sqrt{x^2+y^2}}$, $\bar{y} = \tan^{-1}\dfrac{y}{x}$, and $\bar{z} = \log\sqrt{x^2+y^2+z^2}$, solve for x, y, and z in terms of $\bar{x}$, $\bar{y}$, and $\bar{z}$.

2751. Proposed by J. L. RILEY, Stephenville, Texas.

Every number whose square is the sum of the squares of two consecutive integers is equal to the sum of the squares of three integers of which two, at least, are consecutive.

2752. Proposed by PAUL CAPRON, U. S. Naval Academy.

Given a parallelogram with center O, vertices $PQP'Q'$, mid-points of sides $ABA'B'$ (cyclic order $PAQBP'A'Q'B'$). Let K be any point of OA. Draw KLH parallel to $Q'Q$ cutting AQ at L, and draw BLM, meeting OA produced at M. Draw MH, parallel to PP', to meet KLH at H, and draw $B'KE$ to meet BL at E. Repeat, changing A, B, P, Q to A', B', P', Q', respectively, and *vice versa*. Repeat each of the foregoing, changing P, P', B, B' to Q, Q', B', B, respectively, and *vice versa*.

What are the loci of E and H? Show that EH passes through A' when K is a point of OA, through A when K is a point of OA'. Consider the effect of interchanging the rôles of A and B.

(This construction, as commonly given, is specialized in these particulars: the parallelogram is rectangular, the divisions of OA are equal, and the locus of H is not found.)

SOLUTIONS OF PROBLEMS.

385 (Calculus). Proposed by H. B. PHILLIPS, Massachusetts Institute of Technology.

If $f(x)$ is continuous between a and x, show that

$$\lim_{n=\infty}\frac{\underline{|n}}{(x-a)^n}\int_a^x\cdots\int_a^x f(x)dx^n = f(a).$$

SOLUTION BY LOUIS WEISNER, Student, College of the City of New York.

Let $f(x) = \phi^{(n)}(x)$, n being finite.

Hence,

$$\int_a^x f(x)dx = \phi^{(n-1)}(x) - \phi^{(n-1)}(a),$$

$$\int_a^x\int_a^x f(x)dx^2 = \phi^{(n-2)}(x) - \phi^{(n-2)}(a) - (x-a)\phi^{(n-1)}(a),$$

and

$$\int_a^c\int_a^x\int_a^c f(x)dx^3 = \phi^{(n-3)}(x) - \phi^{(n-3)}(a) - (x-a)\phi^{(n-2)}(a) - \frac{(x-a)^2}{2}\phi^{(n-1)}(a).$$

Integrating n times, we have

$$\int_a\cdots\int_a^c f(x)dx^n = \phi(x) - \phi(a) - (x-a)\phi'(a) - \frac{(x-a)^2}{\underline{|2}}\phi''(a) - \cdots - \frac{(x-a)^{n-1}}{\underline{|n-1}}\phi^{(n-1)}(a).$$

But

$$\phi(x) = \phi(a) + (x-a)\phi'(a) + \frac{(x-a)^2}{\underline{|2}}\varphi''(a) + \cdots + \frac{(x-a)^{n-1}}{\underline{|n-1}}\phi^{(n-1)}(a) + \frac{(x-a)^n}{\underline{|n}}\phi^{(n)}(a)$$

$$+ \frac{(x-a)^{n+1}}{\underline{|n+1}}\phi^{(n+1)}(a) + \frac{(x-a)^{n+2}}{\underline{|n+2}}\phi^{(n+2)}(a) + \cdots.$$